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ABSTRACT

This booklet presents the text for an environmental education learning sequence designed to enhance environmental knowledge and environmental ethics by providing information about: (1) energy; (2) pollution; (3) interrelationships; (4) impacts; (5) cycles; and (6) quality of life. The sequence, suitable for students in grades 5 through 8, is based on accepted principles of developmental psychology in both the cognitive and affective domains. In addition, the sequence has been specifically constructed to provide data regarding levels of maturation within these domains. In the case of environmental ethics, the sequence conforms closely to the three Kohlbergian levels of moral development. This theoretical grounding results in more effective learning and in obtaining informative data about learners' levels of thinking and problem-solving. (JN)

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Connections in Our World:
Focus on Environmental Education

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Preface

These materials provide one of two comparable environmental education experiences. We have prepared a synchronized slide/tape program containing the same information. For educational purposes, teachers may wish to convey the subject-matter using either or both formats.

The paper-and-pencil (i.e., booklet) and slide/tape forms of the program are designed to enhance environmental knowledge and environmental ethics by providing information about energy, pollution, interrelationships, impacts, cycles, and quality of life. A unique feature of these materials is that they are based on accepted principles of developmental psychology in both the cognitive (i.e., environmental knowledge) and affective (i.e., environmental ethics) domains. Both the educational materials and the testing materials designed to compliment them (see Yambert, Dillor, Donow, 1984) have been specifically constructed to provide data regarding these levels of maturation. In the case of environmental ethics, the materials conform closely to the three Kohlbergian levels of moral development. Other declarative and procedural knowledge tapped in these materials is sequenced according to widely accepted principles of cognitive development (see Mussen, Conger, and Kagen, 1979). This theoretical grounding is conducive both to more effective learning and more developmentally informative data about learners' levels of thinking and problem solving.

The materials are appropriate for use with learners ranging from grades five through eight. We believe these materials fill an important need in environmental education; specifically, the need for theoretically sound learning materials, suitable for use during middle childhood.

CONNECTIONS

Everything in our world is connected to everything else. Some of the connections are easy to see and understand because they involve only a few living things. Others are not so easy because they involve many living things. Some connections are quite far away--either in distance or in time. But if we think about them, we can find them.



Simple Connections

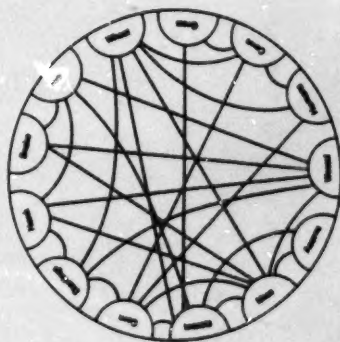
Understanding how things are connected can be like solving a puzzle. In the first puzzle on this page, what could you add to show the connection between eating hamburgers and a pasture on a farm? The meat in hamburgers comes from cows. Cows eat grass. The missing piece from this puzzle is a cow. Hamburgers are connected to cows, and cows are connected to grass.

The second puzzle on this page asks you to find a connection between a fish dinner and plants growing in a lake. First, someone has to catch a large fish. Large fish eat medium-sized fish and those fish eat smaller fish. The small fish eat plants that grow in water. So, a fish dinner is connected to plants that grow in a lake. The missing piece from this puzzle is a fish.

These connections are called FOOD CHAINS. Food chains show how animals and plants depend on each other. A hawk may eat a snake. Snakes eat frogs. Frogs eat insects. Insects eat mushrooms. The hawk's dinner can be traced to plants. Indeed, all of our food can be traced to plants. That is one reason why understanding connections is so important.

So far, we have been talking about food connections or food chains, but there are many other ways that all creatures are connected. One example is a CLOTHING CHAIN. When you wear a wool sweater, that wool came from a sheep. Sheep eat grass. So your wool sweater is connected to grass. When you wear a cotton shirt, the cotton came from a cotton plant. So you can see that we have clothing chains as well as food chains.

Complex Connections



We have been looking at simple, direct connections. In the real world, connections are much more complex. For example, in the circle picture showing connections, a cow is directly connected with corn. But since corn is directly connected with mice, cows are also connected to mice. In fact, as you can see in the picture, just about everything is connected to everything else—in one way or another.

There are some unusual connections that most of us don't think about. For example, a cat is connected with a hamburger. We know that hamburger meat comes from cows, and that cows eat plants. Some plants need bumblebees to spread their pollen. Bumblebees build their nests in the ground. They store their honey in these nests. Field mice like to eat this honey. If they eat all of it, the bees will die. But, if there are cats in the field, they catch the mice. Then the honey is safe. If there are cats to keep the mice from eating all of the honey, the bees are able to spread the pollen to plants so that the cows will have food. That is the story about how cats have an IMPACT on hamburgers. The connections between cats and hamburgers may seem distant, but they are very real.

Web of Life

Another way to describe how all living things are connected is to think of a web, a WEB OF LIFE. If something pulls one part of the web, all parts are affected.



Changes in the way we live affect our environment. Some of these changes make our environment better, and some make it worse. For example, when people start building houses and towns where there used to be open fields and forests, many things happen to that environment. Houses and yards may be better for robins, sparrows, and rabbits because they like open, grassy areas. But houses may make the environment worse for deer, bears, and raccoons because they need more space and more trees.

There are things that we can do to increase the good impacts and decrease the bad impacts. Some of these things we can do to help animals are:

1. Feed the birds.
2. Build bird houses.
3. Plant shrubs so the animals will have food and homes.

Some of the reasons we should care about wild animals are:

1. Many of them help us.
2. They are pretty and fun to watch.
3. They have a right to live, too. They need homes and food just like we do.

A Story About Elm Trees

Several years ago our elm trees had a disease and they were dying. To try to save them, a pesticide, DDT, was sprayed on the trees. The DDT was mixed so that it would stay on the leaves instead of being washed off by rain. When the leaves fell in the autumn, earthworms ate the elm leaves. But they were also eating DDT that was still on the leaves. The DDT stayed in their bodies. Robins came along and ate the worms. The robins got very sick.

This story about robins and pesticides shows another way that food chains can work. Scientists decided that DDT was so dangerous that we made laws against using it in the United States.

There are always good impacts and bad impacts when we use pesticides like DDT. They may help us grow more food by killing insects that eat crops. But they may kill insects or other species that we didn't want to kill. Modern pesticides don't just go away. They may stay in the environment forever. So, another danger in spraying pesticides is that they may pollute our water.

Some of our most serious water pollution problems are caused by chemical pesticides which get in our drinking water.

Should we make laws against all pesticides if they are so dangerous? Remember that pesticides have some good effects. Maybe the best idea is to think about all of the good effect and all of the bad effects: the good ones like helping farmers raise more food, and bad ones like killing robins. Then we can decide whether the good effects are more important than the bad effects.

We can use fewer pesticides if we use other ways to control insects that we do not want. For example, there are ways to control mosquitoes without pesticides. Bluebirds and martins are birds that eat mosquitoes. If we put up houses for these birds, they will eat thousands of mosquitoes every day. And birds are less likely to harm to the environment than pesticides.

Energy

Here are some other ways you and your family can help reduce harmful impacts on the environment.

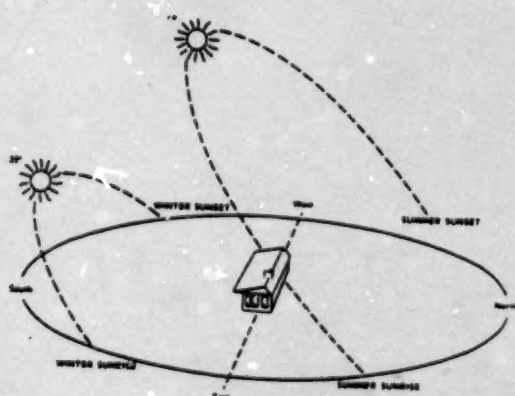
1. Eat some vegetarian meals. That way it takes less energy to feed us.
2. Ride bicycles to save gasoline and reduce pollution.
3. Use solar heat if possible. Solar energy comes from the sun.
4. Keep the temperature in your house turned low so you can save heating fuel.
5. Buy small cars that use less gasoline
6. Use insulation in buildings so that it takes less fuel to heat or cool them.

Saving gasoline and energy is important for many reasons. Some of these reasons are listed below.

1. We can save money.
2. We should conserve fossil fuels like coal and oil because fossil fuels are not renewable. When they are gone, they cannot be replaced.
3. We need to conserve fossil fuels for people in the future.
4. We can reduce air and water pollution.

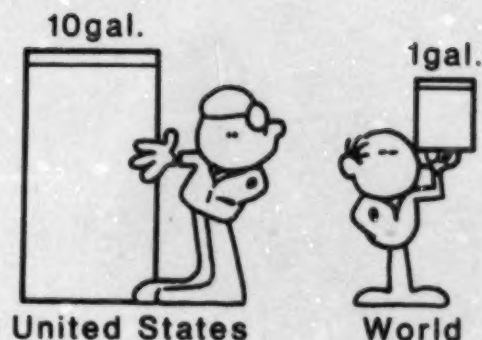
Solar Energy

One way to conserve fossil fuels is to use more solar energy, or energy from the sun. Actually, solar energy has been used for a long time to heat homes. The American Indians built homes in the cliffs so that in the winter the sun heated them. In the summer they were shaded from the sun. The Indians clearly understood how the sun moves through the sky during the different seasons. To get the most warmth from the winter sun, the Indians built their windows facing south.



You can understand why their windows faced south if you look at the picture on this page. This picture shows the position of the sun in our part of the world. In the winter the sun is low in the southern sky.

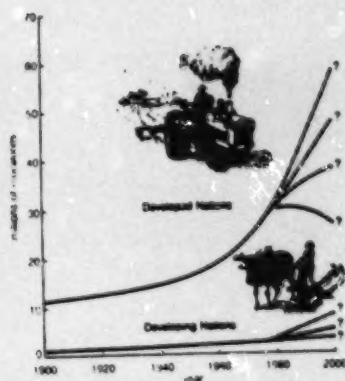
Many modern homes are heated by the sun. Like the Indian homes, they are designed to



capture the heat from the winter sun by having most of their windows face south. You can probably think of several other ways that solar energy is used to conserve fossil fuel.

Other Countries

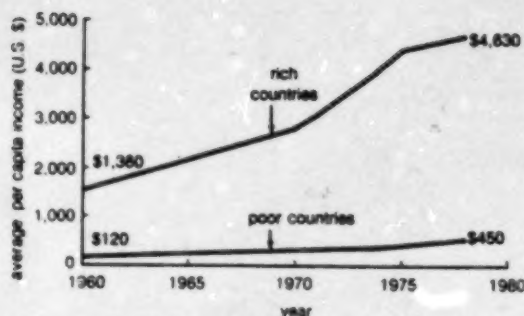
People in the United States use more of the world's fossil fuels than any other nation. The average person in the United States uses about ten times as much oil as the average person elsewhere in the world. Part of the conflict in the world is because not everyone agrees on what is really a fair share of the oil and other natural resources.



The graph on this page compares how much energy the developed countries use to how much energy developing countries use. Some of the developed countries are the United States, Great Britain, and France. Some of the developing countries are India, Nepal, and many African nations. The question marks and dotted lines mean that we are not sure what will happen in the future. Is it fair for some countries to use so much more energy than other countries?

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The graph on this page shows the difference between the average income in the rich countries and the average income in poor countries. It seems that as time goes on, the rich get richer and the poor fall farther behind. Do you think the rich nations should share more with the poor nations?



Some school children were asked why we should be concerned about people who live in other countries. Their answers were:

1. Because they might get mad at us and start a war.
2. Because other people have rights to use fossil fuels, to have clean air, and to have enough food to eat.
3. Because it is not fair for one or two countries to use more than their fair share of fossil fuel, food, and other resources.

Do you agree? It is not easy to know what really is fair. We are trying to solve that problem. Maybe the rich countries could help poor countries find and use the natural resources in their own countries—resources that they are too poor to use now. It is hard for us to agree on what's fair and even more difficult for us always to do what's fair.

We all need to work together. When we think about the web of life, we should remember that this delicate web of connections includes all of the earth, even to outer space. It also goes across time, from the distant past to the distant future. If we really want to be fair, we must think of our connections to all creatures, to all places, and for all times.

Author Note

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